7-1-1888

When to cut corn for ensilage, Bulletin, no. 3

New Hampshire Agricultural Experiment Station

NEW HAMPSHIRE

AGRICULTURAL

EXPERIMENT STATION,

HANOVER, N. H.,

BULLETIN NO. 3.

WHEN TO CUT CORN FOR ENSILAGE.

JULY, 1888.

WHEN TO CUT CORN FOR ENSILAGE.

Several inquiries have been addressed to this station relating to the time of cutting corn for ensilage, and as the season for securing this crop is rapidly approaching I have changed my original plan of issuing a bulletin on Chemical Fertilization and have substituted in its stead a partial answer to the above mentioned questions.

There must be a time somewhere between seeding and full maturity when corn is at its best as a forage crop, and it has been our aim to practically determine this, if possible.

The data presented in this bulletin is not offered as conclusive evidence in the case but simply as the first step towards proof, and but for the demand for information on the part of the farmers I should prefer to have another year's results before publishing those of last year. The plan of the work was to select samples from each of the four varieties of corn experimented with at various intervals and to note their height, weight and degree of maturity. The per cent. of water was then determined and a complete analysis of the dry substance made. This work was carried out as fully as the limited means at that time available would permit. The amount of work was too small for the best results but so far as it went it was carefully conducted.

Table A shows as follows: Column 1 the variety of corn, 2 date of sampling, 3 per cent. of water at the time samples were taken, 4, per cent. of dry substance; the next seven columns show the per cent. of albuminoids, ether extract, fibre, nitrogen free extract, total ash, phosphoric acid and potash. In other words this table shows complete analysis of four varieties of corn at four periods, or in all sixteen analyses.

In any article of food whether for man or beast the valuable part, or that which sustains life and nourishes the body, is included in the dry substance, hence it is not always the total weight that is the best guide, but it is often true that the weight

is a very poor indicator of value. The method of determining the dry matter in any substance is a comparatively simple one in the laboratory; a small sample is weighed and dried at a

TABLE A.

Kind of Corn.	Time of sampling.	Chemical composition.								100 parts of water free or dry substance contain				
		Water.	Dry substance.	Albumenoids.	Ether extract.	Fibre.	Nitrogen free extract.	Ash.	Phosphoric acid.	Potash.	Albumenoids.	Ether extract.	Fibre.	Nitrogen free extract.	Ash.
Southern Ensilage Corn.	July 26.	91.25	8.75	1.6	.34	2.03	3.99	.79	.0121	.0340	18.31	3.9	23.2	45.59	9.0
	Aug. 5.	89.19	10.82	1.52	.51	3.05	4.81	.93	.0295	.0613	14.06	4.7	28.2	44.44	8.6
	Aug. 19.	84.95	15.05	2.55	.75	3.90	7.11	1.04	.0275	.0572	16.95	5.0	25.9	47.22	6.9
	Sept. 16.	75.40	24.6	2.36	.55	5.35	14.35	1.13	.0269	.0717	9.59	2.35	21.5	59.20	4.6
Sanford.	July 26.	90.35	9.15	1.42	.61	2.06	4.31	.75	.0271	.0004	15.61	6.7	22.5	46.99	8.2
	Aug 5.	86.79	13.21	1.83	.73	3.06	6.88	.90	.0368	.0457	12.35	5.5	23.15	51.70	7.3
	Aug. 19.	86.75	13.20	1.49	.57	3.85	7.27	.73	.0273	.0322	11.20	4.3	29.1	54.84	5.5
	Sept. 16.	77.2	22.80	2.11	1.08	4.81	13.35	.93			9.25	4.73	21.07	60.75	4.1
Pride of North.	July 26.	90.65	9.35	1.63	.44	2.29	4.00	.99	.0619	.0894	17.50	4.7	24.45	42.75	10.6
	Aug. 5.	87.56	12.44	1.97	.56	3.35	5.55	1.02	.0553	.0886	15.84	4.52	26.94	44.61	8.16
	Aug. 19.	82.25	17.75	1.92	.67	3.97	10.27	.90	.0388	.0414	10.83	5.0	22.34	57.86	5.07
	Sept. 16.	70.45	29.55	3.29	1.59	6.04	16.9	1.77	.0888	.0312	11.03	5.35	20.45	57.20	6.06
Northern Field Corn.	July 26.	87.75	12.25	1.73	.82	2.99	5.53	1.07	.0367	.0341	14.81	6.7	24.4	45.57	8.75
	Aug. 5.	86.10	13.90	1.88	.62	3.25	7.51	.66	.0392	.0268	13.41	4.4	23.4	54.06	4.68
	Aug. 19.	81.45	18.55	1.69	.59	4.56	10.48	1.02	.0393	.0534	9.2	3.2	24.6	56.52	5.48
	Sept. 16.	72.40	27.60	2.25	1.32	4.79	17.17	1.69			9.6	4.7	17.35	62.23	6.13

temperature of 212 degrees until it no longer loses weight, then the final weight is noted, and the difference between this and

the original weight of sample shows the amount of water that was originally in the substance under consideration, for at the temperature above mentioned only the water is driven off.

Taking our third column in the table and it is seen that at any time there is a very large per cent. of water in the corn. Take for illustration the sample of ensilage (Southern) corn July 26. Here was 91¼% of water. From Table F we see that an average stalk weighed 15 ounces; 91¼ per cent. of fifteen is 13.68, the amount of water which such a stalk contained, leaving only 1⅓ ounces of dry substance. Take the same variety of corn Sept. 16 and there was still 75.4% of water, and as an average stalk weighed almost three pounds, it follows that each stalk contained 2 lbs, 3½ ounces, or more than a quart of pure water, leaving but three-fourths of a pound of actual nutritive matter. This point is dwelt upon for the purpose of showing that pounds or tons per acre are not necessarily a reliable standard of value, and also to show that not everything stored in the barn or in the silo is food, but rather that in these cases but a small portion is actual nutrient material. A study of Table A shows that in each variety of corn there was a substantial increase in the per cent. of dry matter, as is shown by Table B, in which the number of pounds of dry substance in a ton of the corn is given for each variety at each time of sampling.

TABLE B.

POUNDS OF DRY SUBSTANCE IN ONE TON OF 2000 LBS.

Date.	Southern or ensilage corn.	Sanford.	Pride of the North.	Northern field corn.
	lbs.	lbs.	lbs.	lbs.
July 26,	175	183	187	245
August 5,	216	264	248	278
August 19,	301	264	355	371
September 16,	492	456	591	552

It will be seen from this that the value of the corn per *ton* increased in a marked degree from August 19th to Sept. 16th, but this is deceptive as a part of this is due to a decrease of weight per acre by loss of water in maturing. So far as it extended this loss was precisely like the drying of hay, making the increased value *per ton* very marked, but from Table F it will be seen that the actual increase per *acre* is much less.

In Table C I have arranged the per cent. of increase per *ton* and per *acre* for the period from Aug. 19th to Sept. 16th.

TABLE C.

VARIETY.	PER CENT. OF INCREASE OF DRY SUBSTANCE FROM AUG. 19 TO SEPT. 16.	
	Per Ton.	*Per Acre.*
Southern Corn,	63.4 per cent.	37.7 per cent.
Sanford,	72.7 "	32. "
Pride of the North,	66.4 "	16.8 "
Northern Field,	48.8 "	35.3 "

and a glance at this is sufficient to show that a part of this apparently large gain per ton is not a gain at all. The fact remains however that there is about 33% of actual gain in this last period.

Returning to Table B we shall see that there is a marked difference not only between the varieties but also in the same variety at different dates, and so far as this table is concerned it is evident that the *quality* of the product in every case improved up to the time of cutting.

TABLE D.

Variety of Corn.	Estimated dry substacce, *per acre.*				Per cent of increase for each period over the preceding one.			Gain per cent from July 26 to Sept. 16.
	July 26.	Aug. 5.	Aug. 19.	Sept. 16.	Aug. 5.	Aug. 19.	Sept. 16.	
Southern,	1147	3536	7333	10102	207.4	107.3	37.7	780.7
Sanford,	972	3919	5292	6980	303.2	35.3	32.0	618.0
Pride of North,	1012	3366	6340	7410	232.6	88.3	16.8	632.2
Northern Field,	2135	4925	6519	8832	126.	32.4	35.3	313.6

Table D is made up from Table F and shows in a condensed form the rate of increase of dry matter. In discussing this table it must be borne in mind that the four varieties of corn

TABLE E.

Condition of corn as regards maturity.

Variety of Corn.	July 26.	Aug. 5.	Aug. 19.	Sept. 16.
Southern,	Tassel not formed.	Tassel not in sight.	Silk just in sight.	Kernel blistering
Sanford,	Tassel just in sight.	Tassel out but no silk.	Kernel blistering	Kernel full.
Pride of North,	Tassel not in sight.	Tassel and silk in sight.	Kernel well formed, silk brown.	Kernel full.
Northern Field,	Tassel well out.	Kernel blistering	Kernel full but not glazed.	Kernel wholly glazed, husk yellow.

were unequally developed though planted at the same time. Some were earlier than others, and from notes recorded when the samples were taken I have prepared the following table showing in a concise form the relative condition at each period.

The Sanford and Pride of the North, the latter being a dent corn raised in Minnesota, were about alike in earliness, the Sanford being a little ahead July 26 and a little behind Sept. 16, showing that the Minnesota corn is a little more rapid in growth, thus making it a little more certain in maturing its seed. It will be seen from Table D that the Sanford increased much more from July 26 to Aug. 5 than did the Pride of the North, but for the next period the increase was reversed. For the whole period, however, the increase was nearly the same. With the Southern corn the increase of dry substance was very marked up to Aug. 19, at which time its tassels were not in sight. This rapid gain no doubt continued for several days after this date. The total gain from July 26 to Sept. 16 is greater in this variety than in either of the others. Because its period of rapid increase is longer and if early frosts did not interfere with the perfect maturity of this variety there is no doubt but that it would produce a more profitable crop per acre than any kind of corn thus far experimented with, but as a matter of fact this variety, in point of development, is in the same condition Sept. 16 that the Sanford is a month earlier or the Northern field corn forty days earlier.

The Northern field corn increased less than either of the other varieties, but this is more apparent than real for it was so far developed July 26 that it had a large amount of dry substance, in fact its period of rapid increase was past, it being fully twelve days ahead of the Sanford and Pride of the North, and forty days ahead of the Southern.

TABLE F.

Variety of Corn.	Plants per acre.	Weight per stalk.				Computed weight per acre.			
		July 26.	Aug. 5.	Aug. 19.	Sept. 16.	July 26.	Aug. 5.	Aug. 19.	Sept. 16.
		oz.	oz.	oz.	oz.	lbs.	lbs.	lbs.	lbs.
Southern,	13980	15	37.4	56	47	13106	32678	48875	41066
Sanford,	17750	9.6	26.8	36	27.6	10625	29688	39937	30618
Pride of North,	14433	12	30	39.6	27.8	10824	27061	35721	25077
Northern Field, (flint),	22857	12.2	24.8	24.6	22.4	17428	35428	35142	32000

Table F. continued.

Actual amount of water, dry substance, and the separate constituents of the dry substance per acre, for each variety of corn at each of the four dates at which samples were taken, (these are in pounds per acre).

Variety of Corn.	July 26, 1887.									August 5, 1887.								
	Water.	Dry substance.	Albumenoids.	Ether Extract.	Fibre.	Nitrogen free extract.	Ash.	Phosphoric acid.	Potash.	Water.	Dry substance.	Albumenoids.	Ether Extract.	Fibre.	Nitrogen free extract.	Ash.	Phosphoric acid.	Potash.
Southern,	11959	1147	209.7	44.5	262	523	103.5	1.6	5.5	29142	3536	496.7	166.6	996.6	1572	304	9.8	20
Sanford,	9653	972	151	65	218	458	80	2.8	6.4	25769	3919	484	216	908	2042	267	17	12
Pride of North,	9812	1012	176	48	247	433	107	6.7	9.6	23695	3366	533	151	906	1501	276	15	24
Northern Field, (flint),	15293	2135	312	143	521	972	186	6.4	6.0	30503	4925	665	219	1150	2660	232	13.8	10.3

Variety of Corn.	August 19, 1887.									September 16. 1887.								
Southern,	41542	7333	1098	366	1905	3474	490	13.4	28	30964	10102	969	238	2443	5987	464	11	37.6
Sanford,	34645	5292	595	227	1309	2903	292	27	13	23637	6980	646	331	1473	4241	285		
Pride of North,	29381	6340	686	240	1419	3669	322	24.6	14.3	17667	7410	815	399	1514	4238	444	22.3	8.6
Northern Field, (flint)	28623	6519	664	208	1603	3684	359	14	19	23168	8832	848	416	1533	5424	541		

In all the varieties there was a great falling off in the rate of increase immediately after the tassels are put forth, the plant evidently accumulating dry substance much more rapidly while the tassels were being developed than at any subsequent period.

Table F shows the computed amount of total crop and of each constituent of the crop per acre for each variety and each period. The general indications of this table have already been noted. In the final results at harvest time it appears that the Southern corn produced the most dry substance per acre, also that the Northern field corn came next, Pride of the North next and Sanford last, but as was shown in Bulletin 2 the feeding results show best for Sanford, the Northern coming next and the Southern last. The Pride of the North was not experimented with in feeding.

Just why the economy of the three varieties should be the reverse of their product per acre is a question hard to answer. In the case of the Northern field corn it was fed to cows that had been long in milk, and therefore the natural shrinkage would make the cost per quart of milk greater even on the same food, and it is fair to presume that under like conditions there would have been no great difference in feeding value, but why the Sanford should prove so much the superior of the Southern can only be attributed to the fact of its being a mature plant while the rank and late Southern corn was immature, and although chemical analysis shows them to have been nearly alike, yet the condition of the nitrogenous matter may have been such that pound for pound it was less valuable. This point could only have been determined by separating the albumenoid from the non-albuminoid nitrogen.

In conclusion we may say that, all things considered, it is best to plant such varieties as will in a given locality produce plants having well filled ears, the kernels being in the milk or better still in the "doughy" state, and to delay the harvesting until the plant shows evident signs of ripening such as the turning of the lower leaves, the glazing of the kernel in the flint or the shrivelling of the dent varieties. Up to this point there is a gain in two ways: first, an actual gain in the dry matter as shown by Table F, and second, a loss of water, (see Table A) reducing the ratio between the water and dry sub-

stance to about that required by cattle, thus improving the ensilage and reducing the labor in handling.

G. H. WHITCHER,

Director.

Address all communications to the New Hampshire Agricultural Experiment Station, Hanover, N. H.

These Bulletins are free to farmers in New Hampshire and a postal card with full address is all that is required to insure to any one all the Bulletins and Reports as issued. There is an opinion among many that Bulletins will be issued *monthly*. This is wrong. Bulletins will be issued as fast as there is material which is of interest, but under no condition will this station issue bulletins unless such material has accumulated whether the period is one month or three, for there can be no greater mistake than to suppose that bulletins can be issued regularly. The law establishing this station wisely recognized this fact and only required that four be issued annually. G. H. WHITCHER.